Yellow Fever
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REPORT

OF THE

MEDICAL OFFICER,

1912—1913.

APPENDIX A.—No. 3.

A Brief account of the Incidence of Yellow Fever throughout the World during 1911 and 1912; by Dr. R. Bruce Low.

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EXTRACT FROM THE REPORT OF THE MEDICAL OFFICER.

TO THE RIGHT HONOURABLE JOHN BURNS, M.P., PRESIDENT OF THE LOCAL GOVERNMENT BOARD.

SIR,

I HAVE the honour to submit a record of the work carried out in the Board's Medical Department in 1912–13.

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Yellow Fever.

Much attention has recently been drawn to yellow fever by the discussions at the last International Sanitary Conference at Paris in 1912, and by the researches which are being carried out in various parts of the world. There exists, furthermore, apprehension in the minds of some experts that the opening of the Panama Canal may furnish facilities for the spread of the infection, as a consequence of the linking up of the Atlantic and Pacific Oceans and the shortening of the voyage to Europe from the much-infected yellow fever areas on the north-west coast of South America and in Central America. Whether or no these fears are groundless remains to be proved. In view of these considerations it has been thought desirable to include in this and in future Annual Reports of your Medical Officer an account of the reported incidence of yellow fever throughout the world, along with the summaries relating to the two other exotic diseases, plague and cholera.

As the present summary is the first of the series, Dr. Bruce Low has prefaced his brief "Account of the Incidence of Yellow Fever throughout the world during 1911 and 1912" (Appendix A, No. 3, page 148) with a short sketch of our present knowledge of its etiology and geographical distribution. Fortunately this disease, unlike plague and cholera, spreads with difficulty in the absence of certain climatic conditions which are not found in this country, unless in exceptionally hot summers. Apart from ship-borne cases, the incidence of yellow fever is practically limited to certain areas in South and Central America, some islands in the West Indies, and a portion of the west coast of Africa. The light thrown on the etiology of the disease, by the Commission appointed by the United States Government in 1900, has led to the formulation of methods of prophylaxis which, when properly carried out, appear to give satisfactory results, one of the chief points being the destruction of the insect-vector of the virus, the stegomyia fasciata, and its breeding places. It appears that the native races, in the regions where yellow fever is endemic, suffer during childhood from a mild form of the infection, which confers upon them a certain degree of

immunity from attacks in after life. Instances of epidemics arising when non-immune persons arrive in these regions will be found in Dr. Bruce Low's report. For this country, danger can only arise when a ship arrives during a very hot summer or autumn from an infected port, bringing with it infected stegomyia mosquitoes, or having had on board during the voyage at least one patient suffering from yellow fever. The last recorded outbreak of the kind at a British port dates as far back as 1865. It may be added that an investigation into yellow fever in West Africa is being carried out under an advisory committee of experts appointed by the Colonial Office, and it is expected that this inquiry will thrown much valuable light upon the problems associated with this disease.

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I have the honour to be,
Sir,
Your obedient Servant,
ARTHUR NEWSHOLME.

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Appendix A, No. 3.

A Brief Account of the Incidence of Yellow Fever throughout the World during 1911 and 1912. By Dr. R. Bruce Low.

Yellow fever is one of the three principal exotic diseases with which this and other European countries have concern, and in respect of which special provisions have been made by the Great Powers and embodied in the International Convention signed at Paris in January, 1912. Up to the present time, however, owing partly to the fact that the malady is seldom seen in temperate zones, the Board's Medical Department have not thought it necessary to keep so strict a watch upon the occurrences of yellow fever abroad as has been done upon those of cholera and plague. The climatic conditions of England and Wales are unfavourable to the existence of the particular mosquito which acts as the transmitting agent of the yellow fever infection to man. In past years, however, outbreaks of the disease have occurred occasionally in Europe,* when the seasons were exceptionally hot, the disease having been in such cases imported from abroad by mosquitoes on board ships. No instance has been recorded hitherto of transmission of the infection over a long voyage without the presence of an infected person, ill of yellow fever, on board the ship. The last known outbreak of the kind in this country occurred during the autumn of 1865 at Swansea, where upwards of 20 cases and 15 deaths were recorded, the infection having been brought on a sailing ship from Cuba, formerly one of the notorious endemic centres of this malady. The outbreak was investigated on behalf of the Privy Council by Sir (then Dr.) George Buchanan, who found reasons for believing that the disease had occurred at Swansea on previous occasions, namely, in 1843, 1851 and 1864; in each instance the disease had been brought from Cuba on a sailing ship laden with copper ore. In certain ports of France and Spain the same thing has happened even in recent years, the latest instance being an outbreak at St. Nazaire in 1908, when 11 cases and 6 deaths occurred in connection with a steamship newly arrived from the French West Indian Island of Martinique. The possibility, therefore, of the occasional occurrence of the disease in European ports cannot be entirely ignored; so that in future it is proposed to give each year in the Annual Report of the Board's Medical Officer an account of the incidence of yellow fever throughout the world. Some of the areas notorious in the past as centres for the diffusion of yellow fever, such as Habana in Cuba, the Panama Canal zone and the city of Rio de Janeiro, have succeeded in ridding themselves of the endemicity of the disease by the systematic application of modern scientific methods directed chiefly against the yellow-fever mosquito *Stegomyia fasciata*, or as the United States experts prefer to call it *S. calopus*. Quite recently some authorities upon this malady have viewed with alarm the construction of the ship-canal through the Isthmus of Panama, fearing that

* In 1857 a severe epidemic of yellow fever occurred in Lisbon, in which it is said 13,757 persons were attacked and 5,652 died. In Barcelona, in 1870, another similar outbreak was observed, in which the mortality during August and September ranged from 24 to 40 a day. In Madrid a smaller occurrence took place in 1878, in which 50 persons suffered and 30 died (*vide* Report on Yellow Fever in Europe by Dr. J. M. Eager, of the U.S. Public Health Service, published in 1902).

this may bring certain endemic areas of yellow fever into easy and rapid communication with ports in Europe, and more particularly with ports in Asia, where the stegomyia mosquito is already present in abundance; and it is feared that in this way new centres for the diffusion of yellow fever may be established. It is well recognised that the infection of this disease has in former times followed the routes of trade and the lines of human communication by land and sea, so that the linking up of the Pacific and the Atlantic Oceans by the new waterway will probably, in the opinion of these authorities, afford fresh opportunities for the spread of the disease.

Up to the present time the manifestations of yellow fever have been chiefly confined to certain well-defined areas in South and Central America, the West Indian Islands, and the west coast of Africa, in all of which the climatic conditions are favourable to the fostering of the infection and its transmitting insect-host. Whether the American areas or those on the west coast of Africa were the original home of yellow fever will probably never be definitely known, the opinions of experts being divided on the subject, and no trustworthy documentary evidence being forthcoming to support the one or the other view. There is nothing at present to show that yellow fever existed in America at the time of its discovery by Europeans, nor, as is alleged by some on the other hand, that the disease was introduced at the end of the 15th century by the gangs of negroes shipped to the West Indies from West Africa by the Spaniards after they had practically exterminated the native Indian population by the appalling cruelties commonly practised in those days on the coloured races. Some persons, however, hold the opinion that yellow fever, the "vomito negro," existed on the shores of the Gulf when Cortes and his comrades landed there to commence their historic conquest of Mexico; but, as has been said, there does not appear to be any trustworthy evidence upon the point. In the regions where yellow fever is known to be endemic, it shows itself mainly as an affection of childhood; and native adults are generally regarded as possessing an immunity acquired by one or more attacks in early life. It is only when non-immunes appear in these endemic areas that outbreaks are apt to occur, and the arrival of a ship's crew or a party of troops from a healthy region is often the signal for the commencement of an epidemic. Some instances of this will be found further on in these pages.

Hitherto all attempts to isolate and identify the specific parasite of yellow fever have been unsuccessful, though from time to time various microbes have been put forward as the *causa causans* of the disease; not one of them, however, has so far stood the test of time. At the present moment the organism which is *sub judice* by the scientific world, as the true yellow-fever parasite is the so-called "yellow fever body" *paraplasma flavigenum* which was found in the blood of patients by Dr. Harold Seidelin, of the Liverpool Yellow Fever Bureau, and formerly Professor of Pathology in the University of Merida, Mexico; but the claims of Dr. Seidelin have not yet apparently received support from independent investigations (see also page 161), though further researches are being made in West Africa and elsewhere in reference to this organism.

The fact that the specific organism of yellow fever has not yet been definitely identified adds not a little to the difficulties of diagnosing the disease, more especially in cases where the clinical characters of the attack do not altogether conform to the classical description given

in the text-books. It is now admitted by many experts that there are variations in the type and severity of yellow-fever attacks, and that mild or anomalous cases are far from uncommon. The uncertainty as to the diagnosis has in some instances led to disputes as to whether certain outbreaks were due to yellow fever or to some other form of disease such as malaria or bilious remittent fever. In view of the conflicting opinions expressed by medical men as to the presence of yellow fever in one or another area, as for example in West Africa, and in view of the assertion by some authorities that the disease is of more frequent occurrence than has previously been supposed, the Secretary of State for the Colonies, early in 1913, appointed a small Commission of scientific experts to study the nature and relative frequency of the fevers occurring amongst Europeans, natives and others in West Africa, especially with regard to yellow fever and its minor manifestations. The Commission's attention was to be directed to the different fevers which are known to occur there at the present day, their clinical course, pathology and mode of infection; and inquiry was to be made into the nature of bilious remittent, malignant bilious remittent "inflammatory," endemial and "acclimatising fever." The problem of the high infantile mortality rate amongst the natives was to be investigated to see if this might be attributed to any form of fever, and, if so, whether an attack of such disease conferred immunity, temporary or permanent, to yellow fever; also whether there is any racial immunity to yellow fever, or hereditary transmission of that immunity. The nature of the virus of yellow fever, too, was to be studied, and attempts were to be made to find out whether it is limited to man and the stegomyia mosquito. Such a comprehensive inquiry cannot fail to throw light upon the subject of yellow fever, and especially on its endemiology and epidemiology. At the time of writing, September, 1913, the report of the Committee had not been published.

The preventive measures now adopted against yellow fever are based upon the results which were obtained during the investigations begun in 1900 by a Commission of medical experts appointed by the Government of the United States of America, and this modern prophylaxis, it may be added, has proved in recent years highly successful.

SOUTH AND CENTRAL AMERICA.

Brazil.

Manaos.—One of the Brazilian towns in which yellow fever is constantly present is Manaos, with a population of 66,000, situated on the Rio Negro, about 16 kilometres from it confluence with the Amazon. In 1911 there were 210 deaths registered from yellow fever in the town, but the number of non-fatal cases has not been given. Of these fatal instances 147 occurred in the first quarter, 37 in the second, 12 in the third and 17 in the fourth quarter of the year. All the conditions necessary for fostering the stegomyia mosquito are present in Manaos and little is done to improve the state of the town.

During 1912, 96 fatal cases were registered, 38 of which were referred to the first quarter, 36 to the second, 19 to the third and 3 to the fourth quarter of the year. During the first 4½ months of 1913 there were 33 deaths from yellow fever registered in Manaos. The subjoined

table gives year by year the number of reported deaths from the disease in the town since 1903 :—

Year.	Yellow Fever Deaths.	Year.	Yellow Fever Deaths.
1903	85	1909	61
1904	56	1910	173
1905	157	1911	210
1906	117	1912	96
1907	170		
1908	117	Total in 10 years...	1,242

Para (or *Belem*) is another of the towns in Brazil where yellow fever has hitherto frequently recurred. This city, with a population of about 177,000, is situated on the Rio Para, the south arm or estuary of the Amazon, about 900 miles by river below Manaos. During 1911, 82 persons are known to have been attacked by yellow fever in the town, and 49 of them died. The returns for 1912 appear to be incomplete, but only 3 fatal cases were reported in the first quarter of the year, and one ship-borne imported case from Manaos in May, 1913.

Organised measures were begun in 1910 for the suppression of the conditions which have favoured the breeding of the stegomyia mosquito, and as a result there seems to have been a considerable diminution in the number of yellow-fever cases reported during 1912 ; for, as has been just stated, only 3 fatal instances came under observation in 1912, and only a single imported case (from Manaos) during the first half of 1913. The recorded deaths from yellow fever in Para during the 9 years 1904 to 1912, inclusive, amounted altogether to 1,359 as will be seen by the table below :—

Year.	Yellow Fever Deaths.	Year.	Yellow Fever Deaths.
1904	98	1910	358
1905	183	1911	49
1906	149	1912	3
1907	166		
1908	213	Total in 9 years ...	1,359
1909	140		

In the period from 1850 to 1905 the yellow-fever deaths certified in Para are reported to have been 5,007.

Pernambuco (or *Receife*), with a population of 225,000, is another Brazilian port at which year by year fatal cases of yellow fever are reported, though not always in any great numbers. During 1911 only 13 deaths from this disease were certified, and in 1912, 41 others. This town is in an extremely insanitary condition, and until quite recently no proper attempts had been made to exterminate the mosquitoes, which abound in and around the houses in the town. During the first half of 1913 two deaths were reported from yellow fever.

The deaths from yellow fever in Pernambuco since 1908 are shown below :—

Year.	Yellow Fever Deaths.	Year.	Yellow Fever Deaths.
1908	9	1911	13
1909	16	1912	41
1910	45		
		Total in 5 years ...	124

*Rio de Janeiro.**—In former years the capital of Brazil was notorious for its annual epidemics of yellow fever, the infection attacking chiefly the European immigrants landing at the port. For instance, in 1850, it is estimated that about 80,000 persons suffered from the disease out of a population then numbering 266,000. From 1877 to 1902 there were 34,314 deaths from yellow fever in Rio, an annual average of 1,319. In 1903, in which year a vigorous compaign was started against the conditions which favoured the spread of the malady, the fatal cases numbered 584, but since then there has been a very remarkable reduction in the yellow-fever cases and deaths; for some years the only instances met with have been imported from one or other of the infected areas situated in Northern Brazil. During 1911 two cases were notified, one in March on board the s.s. *Carolina* from Bahia, and the other in September on the s.s. *Alagoas* from Rio Grande de Norte, both proving fatal. In 1912 four cases, all imported, came under notice; the first on the s.s. *Tunestall* from Pernambuco, the second on the s.s. *Maranhao*, also from Pernambuco; the third on the s.s. *Minas Geras*, from Ceara in the Brazilian Province of Fortaleza; and the fourth case on a ship from Aracajo, in the Province of Sergipedd (Brazil); three of these four proved fatal. So that although the successful campaign waged against mosquito-favouring conditions has kept Rio de Janeiro practically free from the disease for about 6 years, the other places, where no such efforts have been made, are at all times threatening that city with imported infection. The following figures show the incidence of fatal yellow fever in Rio de Janeiro from 1890 to 1912 inclusive:—

Year.	Yellow Fever Deaths.	Year.	Yellow Fever Deaths.
1890	719	1903	584
1891	4,456	1904	48
1892	4,312	1905	289
1893	825	1906	42
1894	4,852	1907	39
1895	818	1908	4
1896	2,929	1909	—
1897	159	1910	—
1898	1,078	1911	2†
1899	731	1912	3†
1900	344		
1901	299	Total in 23 years...	23,517
1902	984		

In a paper read before the Fifteenth International Congress of Hygiene, which met at Rio de Janeiro in 1912, Dr. G. Conto and Dr. C. de Rezenda stated that from 1850 to 1912 no fewer than 59,071 deaths had been certified in that city from yellow fever. In view of this statement it is much to be regretted that there is recent evidence during 1913 of a slackening in the anti-yellow fever campaign in Rio de Janeiro, the ostensible reason for this being retrenchment with consequent withholding of the necessary funds by the municipality from the Public Health Department of the city. It has been already stated by the local newspapers that during the present year (1913) that cases of yellow fever have occurred in the suburbs of Rio, the origin of which could not be traced as before to imported infection, and that coincidently a great increase in the

* Population 848,271. † Imported cases.

number of mosquitoes infesting the houses had been observed. The men employed as the "anti-mosquito brigade," it is stated, had not received their pay for some months, with the result that a number of them had deserted their posts and obtained other employment. The funds for carrying out fumigation of houses had also failed, so that that part of the work had been left undone. There seems therefore to be some danger of a recrudescence of yellow fever in Rio de Janeiro as a result of the slackening of the vigorous campaign which had previously proved so successful.

The Port of Bahia (otherwise known as San Salvador de Bahia), with a population of 286,000, lies about 800 miles north of Rio de Janeiro. From time to time yellow-fever cases have been reported there, and in 1911 five deaths were certified, with eight others (all of them foreigners) in 1912.

In 1913 yellow fever was prevalent, and during the first half of the year 52 cases and 26 deaths were certified.

The following table gives the reported cases and deaths from the disease in Bahia from 1908 to 1912 inclusive :—

Year.	Yellow Fever.	
	Cases.	Deaths.
1908	26	14
1909	237	97
1910	18	14
1911	5	5
1912	8	8
Total	294	138

Ceara (or Fortaleza de Ceara), in the north of Brazil on the Atlantic coast, is a port in which yellow fever also appears from time to time ; its population is about 65,000. During 1911 a fatal case occurred in April and another in June ; and in 1912, seven fatal cases were certified. Details, however, are lacking as to these occurrences.

From various Brazilian ports infection was carried by ships to other countries, including England ; and among these instances may be mentioned that of a vessel from Para which arrived at Liverpool in January, 1911, with a steward on board suffering from yellow fever which had attacked him after the ship left Para. The case, however, was convalescent on arrival at Liverpool, and after a short detention in the port hospital he proceeded to his home. In May, 1911, a steamship from Manaos arrived at Liverpool with one of its crew convalescing from yellow fever ; he also was only detained for a short time at the port hospital. In July, another ship from Manaos, on arrival at Liverpool, reported that a passenger attacked by fever after leaving Manaos had been landed at Para for treatment. During 1912 five vessels reached Liverpool from Manaos, Para Pernambuco or other Brazilian ports, reporting the occurrence of yellow fever on board at the port of departure or during the voyage. In three of these instances the patient had died, one of the others had been landed at Para, and the remaining patient was convalescent on his arrival at Liverpool. At the New Orleans Quarantine Station a case of yellow fever was landed in September, 1912, from a ship which had come from the Brazilian port of Santos. From these occurrences it is evident that the exportation of yellow fever from Brazil to other countries is by no means infrequent.

Venezuela.

Caracas. (Population 74,000).—Yellow fever was epidemic in Venezuela during 1911, and at Caracas, the capital of the State, 172 cases and 107 deaths were reported. The distribution of these cases and deaths month by month are shown in the table subjoined :—

1911.	Yellow Fever.	
	Cases.	Deaths.
January	25	16
February	24	12
March	15	5
April	10	5
May	6	6
June	7	7
July	9	8
August	17	4
September	8	6
October	13	11
November	17	8
December	21	19
Total	172	107

During 1912 the epidemic continued to manifest itself in the city of Caracas, though not in such large amount as in the previous year. The official return of the cases and deaths appears to be incomplete, but it is admitted that 58 attacks, 27 of which were fatal, occurred up to the month of November.

It is a matter of common knowledge with foreign residents, at Caracas and elsewhere in Venezuela, that the incidence of infectious disease is commonly minimised by the authorities ; and that when there is likely to be inconvenience the periodical returns of infectious sickness are suppressed altogether for a time. This happened in August, 1912, so that it is probable that the incidence of yellow fever in Caracas was greater than the figures quoted above would appear to indicate.

Other places in Venezuela which suffered from yellow fever in 1911 included La Guaira, La Pastora, Mayquetia, Sabana Grande and San Juan, but it is not possible to give any definite figures for these places. In 1912 the disease was also prevalent at La Guaira, Mayquetia (a suburb of La Guiara), Macuto (a health resort three miles from La Guaira), Maracaibo, La Victoria, Cua, Elle Valle and Guarenas. Among those attacked at La Guaira was the Consul for the United States. The sanitary circumstances and administration of many Venezuelan towns leave much to be desired, and conditions are present which favour the multiplication of domestic mosquitoes, including the transmitting agent of yellow fever, the *Stegomyia fasciata.* During 1912 in at least two instances the infection was conveyed from the Venezuelan port of Maracaibo to the port of Frontera, in the Mexican Gulf.

Chili.

Tocopilla.—No outbreak of yellow fever had been reported in Chili in recent years, but in 1912, a serious epidemic developed in the seaport town of Tocopilla, which is situated about 150 miles

south of Iquique, and 109 north of Antofagasta, the disease also appearing among the inhabitants of the copper-mining and nitrate districts in the vicinity. Altogether there were recorded in Tocopilla from January to June 1,100 cases, and of these about 400 died, giving upon these figures a case mortality-rate of 36·0 per cent. The port was officially declared infected on April 25th, 1912, although the first case was observed on January 28th, on board the s.s. *Condor*, which had just arrived from the infected and notorious port of Guayaquil (known to American skippers as "the pest hole of the Pacific"). This patient was thought to be suffering from typhus fever and was conveyed to the lazaretto, where ultimately a diagnosis of yellow fever was arrived at. Meanwhile the infection gained a footing, and in February cases began to be recognised in the town. From this time the epidemic assumed serious proportions, 570 cases and 179 deaths being registered during April, and five separate localities outside the municipality became invaded. In May 237 attacks and 85 deaths were certified, and in June 265, of which 110 proved fatal. After this the epidemic subsided. The stegomyia mosquito was found to be numerous in and around Tocopilla. As soon as the true nature of the prevalent malady was definitely recognised by the authorities measures were taken for the destruction of the local domestic mosquitoes and their breeding places. At the height of the epidemic a number of the inhabitants of the town were seized with panic and fled from Tocopilla, camping out in the open at some distance away, with the view of escaping the infection. The lazaretto was closed on July 15, no new cases having been reported since the middle of June. So far no recurrence of the disease has been announced during 1913 in or near Tocopilla.

Peru.

Iquitos.—In July, 1911, military operations against the Republic of Ecuador in connection with a boundary dispute were undertaken by the Government of Peru. The campaign, though short and successful from the military point of view, was unfortunate in its results as regards the health of the Peruvian troops. The expedition was hastily organised and was without adequate medical service, though the soldiers had to travel through the thick bush and noxious atmosphere of the swamps along the Pitumayo River, which flows through the State of Ecuador into Peru and thence through Brazilian territory to join the waters of the Amazon. The military force proceeded as far as the swampy region along the Caqueta or Yapura River (the boundary claimed by Peru), another tributary flowing eastwards through Ecuador to fall into the Amazon.

On the return of the Peruvian force to their base at Iquitos, in August, 1911, the infection of a disease, not at first recognised to be yellow fever, but afterwards diagnosed as such, began to attack the troops exhausted by the hardships of the expedition, and ultimately an epidemic developed. Iquitos, where yellow fever is endemic, is a town with a population of nearly 20,000, situated on the Upper Amazon in the interior of Peru, and not far distant (about 550 kilometres) from the Brazilian frontier. It is 2,500 miles from the mouth of the Amazon, the river being navigable for ocean steamers up to the town itself. Iquitos is infested by mosquitoes, including the *Stegomyia fasciata*. It is stated by the British Consul that there is a total absence of sanitary arrangements in the town, and notwithstanding the epidemic nothing was done to

improve the condition of Iquitos, which is the centre of a rich country. The political disturbances in this region began during the season for collecting the rubber, and many of the workers were enlisted temporarily for the expedition, and some of them died ultimately of the disease. Iquitos is a busy centre of the trade upon the Upper Amazon and its tributaries, and is in frequent communication by river with Brazil. The yellow fever infection is reported to have been of a virulent kind, and the assembling together in Iquitos of a number of non-immunes lately returned from the military expedition afforded the necessary material for the development of the epidemic.

Definite figures as to the cases and deaths are not forthcoming, but one source of information mentions 76 deaths from yellow fever in Iquitos during 1911 and 50 in the first-half of 1912. It is probable that this does not represent the total incidence of fatal yellow fever in Iquitos during 1911 and 1912.

When the epidemic developed in 1911, the military force was moved away from the town and camped out at some distance off in a healthy locality, where the conditions did not favour the spread of the disease. Although yellow fever is endemic in Iquitos, the authorities maintained that the troops had brought back the infection with them from Eucador.

At the end of 1912 a sanitary expert from the United States was engaged by the Peruvian authorities to take charge of the work for making Iquitos more healthy, including the carrying out of a drainage scheme and other measures.

Ecuador.

Guayaquil.—The Republic of Ecuador has acquired notoriety as one of the chief hotbeds of yellow fever on the west coast of South America. For many years Guayaquil, its principal seaport, has had an evil reputation for giving yellow fever to those on board the ships entering its harbour ; and, as has been already mentioned, it is known in American nautical circles as " the pest hole of the Pacific " and " the chief clearing house " for the spread of yellow fever and plague in that region. The first authentic account of yellow fever in Guayaquil is dated 1740, when it is stated that the infection was brought by a ship from Panama, and in that year the disease destroyed some 5,000 lives. During the 15 years 1880 to 1894, 6,007 patients were treated for yellow fever in the civil hospital and 2,475 died, a case mortality of 41 per cent. In 1911, at Guayaquil (population 60,000), 267 cases of yellow fever were reported, with 102 deaths ; and in 1912, though owing to a revolution no figures were given for January when the epidemic was raging, there were from February to December more than 360 cases and 166 deaths. As showing the severity of the outbreak at the beginning of 1912, it may be mentioned that in February and March there were notified respectively 98 and 96 cases. The town has no drainage, and as the winter of 1911–12 was very rainy the condition of the streets and yards was such as to favour the breeding of the stegomyia mosquito. Some of the streets, it is said, are like quagmires, water standing in pools around the houses. Unfortunately, the revolution caused many non-immune persons, including troops from the interior, to come to Guayaquil, and by this means material for the epidemic was collected. The military only occupied the town for a short time and then returned to the interior ;

but their arrival was followed by a considerable increase in the number of reported cases. The troops on their return journey suffered from the disease, some 200 cases being reported along the railway line on which they travelled, and many of the soldiers who were attacked succumbed to the disease.

A ship of war, the s.s. *Yorktown*, from the United States, arrived at Guayaquil in January, 1912, and shortly afterwards 8 of the crew were attacked by yellow fever, two of the cases proving fatal. So great was the threatened danger to the shipping of the United States that, after protracted negotiations, it was agreed, in November, 1912, to despatch Colonel W. C. Gorgas, of the Medical Corps of the United States Army, to Guayaquil from Panama, accompanied by expert engineers to prepare and carry out schemes for sewering the town, paving the streets, providing a piped water service, and for carrying out other works calculated to eradicate all the local conditions which had so long fostered yellow fever in Guayaquil. The cost of these operations was to be met "on the credit of the United States Government." Colonel Gorgas, it may be mentioned, had achieved great success by his energetic measures in the Panama Canal Zone, formerly a recognised endemic area of yellow fever, but now completely free from the disease except for importations of the infection from such ports as Guayaquil itself. It is known that in the past the official reports on yellow fever in Guayaquil have not indicated the full incidence of the disease, but the following figures, incomplete though they may be, will serve to show the persistence of fatal yellow fever in this notorious seaport :—

Year.	Yellow Fever Deaths.	Year.	Yellow Fever Deaths.
1905	116	1911	102
1906	275	1912	166*
1907	120		
1908	103	Total in 8 years ...	1,223
1909	228		
1910	113		

During 1911, in addition to Guayaquil, other places in Ecuador were attacked by yellow fever, including Babahoyo, Naranjito, Changue, Chobo, Duran, Milagro, Bucay, Taguachi and Calaroma; but precise details as to these occurrences are lacking.

In 1912 a number of towns and districts, as well as Guayaquil, also suffered. Among these were Huigra; 41 cases; Milagro, 34 (24 deaths); Naranjito, 38 (22); Duran, 21 (9); Agua Piedra, 7 (4); Bucay, 9 (4); Taguachi, 5 (1); and Chobo, 2 (1). At Naranjito the cases occurred on a sugar plantation. In most of the above instances it is probable that the infection was derived from Guayaquil.

Colombia.

The Republic of Colombia lies on the extreme north-west of South America, and has a coast line not only on the Pacific but also on the Caribbean Sea. It is reported by local experts that yellow fever has for a long time been endemic on the Caribbean shore of Colombia, at Cucata, along the Magdalena River, and at the Muzo emerald mines, both of the last-named places being situated in the interior.

* Eleven months only.

So far as can be ascertained, no outbreaks of yellow fever have been reported in the Republic since 1909, when the presence of the disease at Cartagena was then announced, until November, 1911, when a single case was notified at the port of Sabanilla (otherwise known as Savanilla or Puerto Colombia), situated in North Colombia on the Caribbean coast. The case occurred upon the schooner *Margarita Sophia*, which had come from Rio Hacha, not far from the frontier of Venezuela, from which country the infection is alleged to have been imported. In this instance the disease does not appear to have spread, and it was not until July, 1912, that another case was officially notified in Colombia at the port of Barranquilla, situated on the north coast, near the mouth of the Magdalena River. In this instance also it is suggested that the infection had been derived from a Venezuelan source, though it has to be borne in mind that yellow fever, as has already been said, is endemic in certain regions through which the Magdalena River flows. It is probable that in Colombia, as in other places where yellow fever is endemic, the disease occurs among the natives, and particularly among children, in a mild form by which immunity to the effects of infection in after life is produced. The severer cases are probably newcomers, travellers, or European sailors at the ports. To produce an epidemic that will attract attention it is necessary that a number of non-immunes should be assembled together and then the endemic virus inoculated by local infected stegomyiæ soon gives rise to the epidemic. The last outbreak of which authentic records are available occurred at Barranquilla in 1900, when 72 cases were reported, and at Cartagena in the same year, when 32 persons were attacked. Since then cases, though in no great numbers, were heard of in Colombia in 1901, 1903, 1904, 1905, 1907 and 1909.

The Panama Canal Zone.

The Isthmus of Panama at one time formed part of the Republic of Colombia, from which it has been separated since the American occupation. Panama was at one time a veritable hot-bed of yellow fever, but since the Medical Corps of the United States Army, under Colonel W. C. Gorgas, took over the sanitary control of the Canal Zone, in 1905, the disease has been suppressed ; the only cases that now occur are those imported on shipboard from infected countries such as Ecuador. The success which has attended the efforts of Col. Gorgas' staff has turned what was formerly regarded as "one of the deadliest pest holes on earth," chiefly owing to yellow fever and malaria, into a comparatively healthy area. It is perhaps not too much to say that this success may be classed as one of the great triumphs of modern science as applied to tropical hygiene. There were no imported or other cases of yellow fever in the Panama Canal Zone during 1911 ; but in 1912 three such instances were recorded. All three were landed at the Panama Quarantine Station on Culebra Island, from two ships which had arrived from the infected Ecuadorian port of Guayaquil, one case being landed in January and the other two in March.

The following table shows the incidence of yellow fever on the Isthmus of Panama from 1900 to 1912, inclusive. It should be noted that the preventive measures in the Canal Zone were begun under Col. Gorgas in 1905.

Year.	Yellow Fever.	
	Cases	Deaths.
1900	62	15
1901	2	2
1902	112	22
1903	116	46
1904	20	5
1905	159	62
1906	1	1
1907	1	—
1908	—	—
1909	2	1
1910	2	2
1911	—	—
1912	3	2
Total in 13 years ...	480	158

It is worth noting that since 1905 there have been only nine cases (with six deaths) and that *all of these were instances of imported infection.*

The area through which the Isthmian canal passes is described as " one of the hotest, wettest and most feverish regions in existence." Its unhealthiness during the period when the French Company constructed the railroad across the isthmus was so great that work was stopped at times for want of labourers. For example, of one batch of 1,000 West African negroes imported to help in the construction all had died off within six months ; another batch of 1,000 Chinese coolies brought to Panama to replace the dead negroes met the same fate within six months of their arrival. From 1881 to 1889 there died in the French Canal Construction Company's nospitals within the canal zone 5,618 employees, but in addition many others who never entered the hospitals died in private houses, or after leaving Panama, from illnesses already contracted there. It has been estimated by Colonel Gorgas that the French Canal Company lost by death 22,189 labourers from 1881 to 1889, the death-rate being more than 240 per 1,000 living. Colonel W. C. Gorgas states that the Mother Superior of the Sisters who act as nurses in the Ancon hospital told him that when she first arrived she had 24 Sisters with her, but in a few years 21 had died, mostly of yellow fever ; of a party of French engineers numbering 18 who arrived together, 17 died in a month from yellow fever. These disastrous events occurred before the recent great discoveries and advances in Tropical Medicine had been made, that is, before the relation of mosquitoes to the spread of disease, especially to yellow fever and malaria, had been discovered, and before the United States Commission had demonstrated that yellow fever infection was transmitted by the stegomyia mosquito and not from man to man as had been formerly believed. It is evident that the progress in our knowledge of insect-borne diseases has led to the formulation of appropriate preventive measures which have averted much illness and saved the lives of many thousands of persons.

Honduras.

The Republic of Honduras, in Central America, has a coastline extending to nearly 400 miles on the shores of the Caribbean Sea.

The last yellow-fever epidemic which attracted notice in this State occurred in 1905, when no fewer than 1,096 cases and 326 deaths were reported. Of these 148 cases and 50 deaths were referred to the seaport town of Puerto Cortez (or Caballos), the terminus of the Honduras National Railway, on the Carribbean coast, and one of the chief ports of the Republic. Only a single case of yellow fever was heard of in 1906; none in 1907–8–9 or –10. In 1911 an imported instance was notified in January, a sailor on an American ship, the *Marietta*, but the precise source from which the infection was derived in his case has not been stated. It may be added, however, that some doubts have been expressed as to the correctness of the diagnosis in this instance.

So far as is known no outbreak of yellow fever has occurred in British Honduras since 1906, when about 100 cases came under observation.

Other Republics in Central America.

In the other Republics of Central America no yellow fever was reported during 1911 and 1912, but all of them have suffered from outbreaks within recent years. The absence of definite information is not to be regarded as proving the absence of the disease, for it is notorious that Central American Republics habitually adopt a policy of concealment where infectious diseases are in question. In *Guatemala* the last recorded yellow-fever outbreak occurred in 1905, at Zacapa, when 1,500 persons were attacked and about 1,000 were certified to have succumbed to the disease. Since then scattered cases have been heard of in 1906 and 1907, but none quite recently. In *Nicaragua* the disease was epidemic during 1905, but there has been no other reported occurrence in this Republic since then. Yellow fever was epidemic in the State of *San Salvador* during 1907, but no details were published at the time. In the Republic of *Costa Rica* yellow fever was prevalent during the years 1901–2–3 and –4. Cases were also reported in 1906–7 and –8, but nothing has been heard recently of the disease in this State. It is probable that yellow fever is endemic in all these Republics of Central America, but that, as has been said of some other places, it smoulders on among the native population in a mild form without attracting much attention, such illness being diagnosed as malaria or something other than yellow fever.

Mexico.

Yellow fever has for a long time been endemic in certain parts of Mexico, though of late years the incidence does not appear to have been so great as formerly. Nearly all the provinces which abut upon the shores of the Mexican Gulf have been sufferers from the ravages of the disease, including Yucatan, Campeachy, Tabasco and Vera Cruz.

Yucatan.—The peninsula of Yucatan juts out in a northward direction into the Gulf of Mexico, and this province has been regarded as an endemic centre of yellow fever for many years. The occurrence of the disease in Yucatan has been reported in each year from 1900 onwards. In and around the city of Merida, the capital of the province, the disease appears to have been prevalent for a long time among the native population. In 1911 yellow fever broke out at

Merida, following upon the arrival of two battalions of Federal troops from the healthy districts of the interior of Mexico, their presence having become necessary owing to the revolutionary movement against the Government. Of the first 50 cases, 47 are said to have been soldiers recently arrived, and presumably non-immunes. The epidemic continued up to April, 1912, after which time sporadic cases continued to be reported during the remainder of the year. The prevalence of the disease was not confined to Merida alone, for cases were also notified in the surrounding districts, including Kambul, Maxcanu, Temax, San Felipe, Espita and Motul. It is generally admitted that many cases were concealed, more particularly among the native population. The official figures published give 74 cases and 38 deaths as having occurred, but there are some reasons for believing that this does not by any means represent the full incidence of the disease in Merida. The outbreak was investigated, on behalf of the Liverpool Yellow Fever Bureau, by Dr. H. Seidelin, who was formerly Professor of Pathology in the University of Merida, and who therefore had not only a good knowledge of the people and the district, but who also had special knowledge of the disease. His report was published in the *Yellow Fever Bulletin* of October, 1912. Though for some time prior to the epidemic anti-mosquito measures had been carried out, it is admitted that they had not been consistently enforced, and had fallen short of what was absolutely necessary; but since the 1911–12 prevalence subsided more comprehensive action have been taken by the local authorities to reduce the number of stegomyia mosquitoes in the town, and to abolish their breeding places. It may be mentioned that Dr. Seidelin himself contracted yellow fever during his recent investigations. He states that he found practically in all the notified cases which he examined, and in his own blood during his attack, as also in some suspected cases of illness in which the diagnosis had been doubtful, the "yellow fever bodies" which he had previously observed, and which he believed to be the specific organisms of yellow fever. To these organisms he had given the name of *Paraplasma flavigenum*. So far, no other investigators, except two of his own former assistants, Dr. Diego Hernandez and Dr. Hircano Ayuso, in Merida, have published observations confirming those of Dr. Seidelin concerning the presence of these parasites in the blood of yellow-fever patients; so that, although at present further researches are still being made, it cannot be said that the specific organism of the disease has been as yet definitely identified, though such discovery would be of the greatest value in the diagnosis of cases of this malady. Dr. Seidelin confirmed what had been previously reported, namely, that yellow fever is endemic in the Merida district, and that the disease attacks the natives, especially children, in a mild form, though typical and fatal cases are occasionally observed even among the resident population. It is, however, generally among foreigners and new arrivals that the more typical and severe cases are observed.

The port of Progresso, on the coast of Yucatan, lies 26 miles from Merida; in the past it has suffered a good deal from yellow fever, but no cases appear to have been reported in 1911 or 1912. During the three years 1907–8–9, about 663 cases of suspected yellow fever came under observation, in at least 119 of which the diagnosis is said to have been with certainty established, and 56 of them proved fatal.

Campeachy.—This province, which lies in the same peninsula, south-west of Yucatan, is likewise regarded as an area in which

yellow fever is endemic, though not to the same extent as in the last-named province. Of late years but few cases have come under official observation. So far as can be ascertained no cases were recognised during 1911, although the occurrence of a case at another Mexican port was attributed to infection from Campeachy; but in 1912, at the port of Laguna del Carmen, the presence of the disease was reported on the s.s. *Puebla*, from Vera Cruz, and this was followed by the occurrence of a second case. During the first half of 1913 some nine other cases were notified, six of them fatal, in the town and port of Campeachy, the capital of the State, and situated 90 miles south-west of Merida.

Tabasco.—This province is situated immediately to the south and west of Campeachy, and is reputed also to be an endemic area of yellow fever. So far as is known no cases came to light during 1911, but in 1912 there was an outbreak at San Juan Bautista, the capital of the province, situated on the river Tabasco 70 miles from its mouth, where its waters are discharged into the Gulf of Mexico. The first cases were noted in May and the prevalence continued till October, about 60 cases being notified. In addition a number of attacks were reported in the vicinity of the town. Other places in this province in which yellow fever appeared during 1912 included Comalcalcos, Cardenas, Conduacon, Jalapa, and Huimanguillo; also the port of Frontera, to which the infection was carried from the capital about 55 miles distant, probably by the troops transferred to Frontera from San Juan Bautista, for at this time yellow fever had been occurring among the soldiers of the Federal Army stationed in the last-named city. Subsequently at Frontera two members of the crew of a Swedish vessel, from Maricaibo, in Venezuela, were attacked by the disease, and subsequently other persons were attacked in the port, but the precise number of these attacks has not been published.

Vera Cruz.—Formerly this province suffered severely from outbreaks of yellow fever, and particularly the city and port bearing that name. The city of Vera Cruz is situated on the seaboard of an uncultivated, swampy plain on the shores of the Gulf of Mexico. As showing the previous incidence of yellow fever in the city of Vera Cruz a special Sanitary Commission for the suppression of yellow fever and other infectious diseases published in the United States Public Health Reports for January 31st, 1913, the appended table, giving the cases and deaths recorded from 1893 to 1912. From this it will be seen that the largest number of attacks were notified in the year 1899 when 1,268 cases and 594 deaths came under official notice. It was about the middle of 1903 that the campaign against yellow fever was begun in Vera Cruz town, and, as will be seen in the table, from 1904 onwards there was a considerable decrease, and finally a disappearance of the malady.

TABLE showing yellow fever cases and deaths reported in the City of Vera Cruz from 1893 to the end of 1912.

Year.	Yellow Fever.	
	Attacks.	Deaths.
1893	449	131
1894	534	209
1895	301	142
1896	12	—
1897	5	3
1898	188	127
1899	1,268	594

	Yellow Fever.	
	Attacks.	Deaths.
1900	544	261
1901	269	103
1902	678	285
1903	1,075	375
1904	73*	12*
1905	54	23
1906	17	12
1907	2	1
1908	43	20
1909	3	3
1910	—	—
1911	—	—
1912	—	—
Total	5,515	2,301

From 1893 to 1903 (13 years) the total cases of yellow fever certified in Vera Cruz amounted to 5,323 and the deaths to 2,230, or an annual average respectively of 409 and 171. But in the nine years from 1904 to 1912—that is, after the institution of the measures specially directed against yellow fever—the total attacks recorded numbered only 192 and the deaths 71, an annual average of 21 and 8 respectively.

As regards the province of Vera Cruz, in March, 1911, a single case was reported at the port of Salina Cruz, which is the Pacific terminus of the railway which crosses the Isthmus of Tehuantepec from the Gulf of Mexico. This instance occurred on board the s.s. *Opland*, which had arrived at Salina Cruz from a Guatemalian port; and in February, 1912, seven cases were landed at the lazaretto from the s.s. *Ikalis* which had come from Guayaquil. The presence of yellow fever at Puerto Mexico (known also as Coatzacoalcos), the Mexican Gulf terminus of the railway across Tehuantepec from Salina Cruz, on the Pacific, was reported in February, and again in May, 1912. These cases contracted their illness at San Juan Bautista, in the adjoining province of Tabasco.

It may be stated generally that in the rest of Mexico, as well as in the province of Vera Cruz, an anti-yellow fever campaign has been carried on since 1903, and that in consequence the amount of the disease reported in the Republic has on the whole greatly diminished in recent years. The degree of this improvement has much depended upon the amount of earnestness and energy with which the campaign has been conducted in the various localities.

The West Indies.

Cuba.—This island was at one time severely ravaged by yellow fever; from 1853 to 1900 35,952 deaths were registered from the disease at Habana. Of late years the malady has practically been suppressed, especially in Habana (population about 300,000), where scientific methods, based on the modern etiology of the disease, have been strictly enforced. The last reported great epidemic in Habana occurred in 1900, when no fewer than 1,360 cases were reported.

* The first year after the commencement of the campaign against yellow fever.

The new preventive measures were instituted in 1901, and after that time there were hardly any cases till 1905, when 68 were notified, and in 1906, 86; in 1907, 23; and in 1908 only 5. No cases were heard of in 1909, 1910, and 1911, but in 1912 a single fatal case, probably an imported one, was registered in the month of July. A later report states, however, that there was some doubt as to the diagnosis of the disease, so that it may perhaps be said that no yellow fever has occurred in Habana since 1908.

Jamaica.—For many years yellow fever was endemic in Jamaica, but of late it has been believed that by the enforcement of appropriate measures the disease has been eradicated. Formerly the British troops sent to garrison the island, and the ships of war which came to this station, suffered greatly during their stay. Since the last epidemic, which occurred in 1897, very little has been heard of the disease. Early in 1911 Capt. T. J. Potter, R.A.M.C., made an investigation on behalf of the Government of Jamaica into the prevalence of "vomiting sickness," which for many years has been frequently met with in the island. The term "vomiting sickness" is, however, popularly applied to any disease in which vomiting is an early and prominent symptom. More recently the local medical men have used it to indicate an acute feverish ailment, often fatal, met with more particularly among children. An alternative name used by the natives for the illness is "black vomit," which in many parts of the West Indies and South America is a synonym of yellow fever (vomito negro). As the result of his inquiry, during which upwards of 70 cases were visited and a number of post-mortem examinations made, Captain Potter came to the conclusion that much of the "vomiting sickness" of Jamaica was really yellow fever, and that the disease was still endemic in the island. This view is not accepted by the local medical men. In particular the Medical Officer of Health for Kingston, the capital of the island, has somewhat vehemently disputed the soundness of Captain Potter's conclusions, and has urged the necessity for further local investigation. The matter may therefore be regarded as still *sub judice.* In the first half of 1911 the number of reported cases of vomiting sickness in Jamaica amounted to 223, 126 of which occurred in one parish (Trelawney). It may be added that some of the reported cases were proved, without doubt, to be instances of cerebro-spinal fever, gastro-enteritis and the like. Further investigations were instituted locally at the instance of the Colonial Office with a view to settle, if possible, the important question as to whether yellow fever was still endemic in Jamaica. In December, 1912, Dr. Harold Seidelin, the Scientific Secretary of the Yellow Fever Bureau, left England for Jamaica to investigate, on behalf of the Liverpool School of Tropical Medicine, the so-called "vomiting sickness," but it is stated that Dr. Seidelin's inquiry has not resulted in establishing any identity of vomiting sickness with yellow fever.

Martinique.—Yellow fever is endemic in the French island of Martinique. The last-reported epidemic in that colony was in 1908, when 206 cases were officially recorded, of which only 30 are stated to have terminated fatally; six cases were reported in 1909, but none in 1910 or 1911. It is, however, known that mild atypical cases occur year by year, especially among the native children, under the name of "fièvre inflammatoire." Scientific investigation points to the conclusion that the local "fièvre inflammatoire" is to be regarded as identical with true yellow fever. During 1912, it is stated that about "the usual number" of endemic cases occurred. The measures

relied upon to keep the disease in check comprise early notification of cases as far as possible; isolation of the sick in properly screened buildings; destruction of mosquitoes and their breeding places; and systematic inspection of lodging-houses, boarding schools and similar institutions where persons are gathered together at night; education of the people in preventive measures is also carried out as far as is practicable.

St. Vincent.—This island has not apparently suffered so much in past years from yellow fever as have some of the other members of the West Indian group. The last cases, prior to 1912, were reported in St. Vincent in 1908, when three attacks with two deaths were certified. In February, 1912, a single case was notified, but its source has not been made public. In all probability it was an imported instance.

Barbadoes.—Yellow fever was present in the island of Barbadoes in 1907, when 12 cases (and seven deaths) were reported, all the cases occurring at Bridgetown, the capital of the island. In 1908 13 cases (11 fatal) were notified in that town, and in 1909 the disease was epidemic in the island, 76 cases being certified with 22 deaths.* In 1910 there were no cases, but in 1911 two instances were noted, one in May and the other four weeks later. Only one notification was received in 1912, the patient being an engineer on board the s.s. *Francis*, which had arrived on April 27th from the ports of Manaos and Para, Brazil. This man fell ill on April 23rd. The ship had left Manaos on April 19th and Para on the 23rd. It is presumed that he received his infection at Manaos. He did not go on shore there, but it is surmised that infected stegomyiæ had come on board the *Francis* from lighters loading alongside in the river. Yellow fever is no longer endemic in Barbadoes, the cases reported in recent years having been obviously due to imported infection.

FRANCE.

In the "Times" of August 23rd, 1912, was published a telegram from the Paris correspondent to the effect that 15 Syrian emigrants who arrived on the previous day at Marseilles from Cherbourg had been declared to be suffering from yellow fever. It appears that these people had sailed from America (the port of departure was not given) on the s.s. *Lanfranc*, and that a case of yellow fever had occurred on board the vessel during the voyage across the Atlantic. After some delay and after medical examination the 15 Syrian emigrants, some of whom were alleged to have been suffering from yellow fever, were certified as free from the disease and permitted to continue their journey to the Near East. Orders were, however, given to have all the places which these persons had occupied at the railway station carefully disinfected.

HAWAIIAN ISLANDS.

Honolulu.—That yellow fever infection can upon occasion be carried across the Pacific Ocean from South or Central America has been demonstrated by the following instance:—The s.s. *Hongkong Maru* arrived on October 21st 1911, at Honolulu and landed a convalescent passenger, who had suffered on the voyage from an attack of yellow fever and who had embarked on the ship at Manzanillo, a port on the Pacific coast in the Mexican province of Colima. The

* Bulletin Mensuel de l'Office International d'Hygiene Public, 1911, page 80.

vessel was placed in quarantine, and on October 28th one of the men who had been placed on the ship as a quarantine guard developed the disease. It is surmised that infected stegomyiae had travelled on the vessel to Honolulu, or that healthy stegomyiae which had boarded the ship at an intermediate port had become infected through feeding on the blood of the passenger from Manzanillo during the early days of his attack. Great alarm was experienced lest the local stegomyiae at Honolulu, should become infected, and somewhat drastic measures were carried out under the direction of the Federal Quarantine Officer, the Territorial Board of Health, and a special committee of citizens. The city was ordered to be cleared of all banana trees, and more than 150,000 of them were cut down,* the experts having declared that stegomyia mosquitoes bred in the water which stands between the leaves and the stalk. It was also intended to eliminate "wet farming," such as the growing of rice and taro in, or close to, the city; further, the filling up of all swampy ground was included in the programme. Fortunately these measures proved successful, for, beyond the convalescent case and the subsequent attack of the quarantine guard on the vessel, no other cases were observed.

WEST AFRICA.

Senegal.—In past years there have been some severe outbreaks of yellow fever in French Senegal. In 1900, for example, 409 cases were officially reported with 222 deaths; but in recent years not much has been heard of the disease. In December, 1911, the presence of the malady was notified in Dakar, a seaport town near Cape Verde, and at Rufisque, which is about 10 miles distant along the coast. During January, February and March, 1912, cases continued to occur at Dakar, St. Louis (the capital of the colony), Thiès (a town 44 miles north of Dakar), and at Livouanne, 58 miles from Dakar. This outbreak, as to which precise details are lacking, appears to have subsided during the summer months, but a fresh prevalence began in September and continued to the end of 1912. On this occasion the cases were reported along two railway lines, the first between Dakar and St. Louis and the other between Thiès and Kayes. This last-named station is in the interior, on the banks of the River Senegal, and at the termination of the navigable part of that waterway. Some fatal cases at Dakar during October were certified as "bilious fever," and the authorities at that time denied the existence of yellow fever in the colony. But later information makes it almost certain that these, as well as other cases of illness among Europeans, were really yellow fever, It was not until November that the Governor-General officially declared Dakar port to be infected by yellow fever and put the epidemic regulations into force. The railway service for passengers between Dakar and Rufisque was suspended, and only mails and certain merchandise were permitted to be taken on special trains run for the purpose. It was alleged by the officials that the infection had been brought to Dakar from "the interior." At places on the Dakar and St. Louis Railway some 25 cases, with 18 deaths, were reported in the last quarter of 1912, but probably this does not represent the total incidence of the disease. Among the towns and villages invaded along this line were Longa, Sakal, Kelle, Tivouanne, Thiès and Dakar. On the Thiès-Kayes branch railway 11 cases and 8 deaths were certified at Khombole, Diourbel, Kaffrine

* Journal of the American Medical Association for December 16th, 1912.

SAHARA DESERT
TIRIS
CAPE DE VERDE ISLANDS
C. Verde
Dakar
Thies
SENEGAL
GAMBIA
Bathurst
PORTUGUESE GUINEA
Bissagos Islands
FRENCH GUINEA
R. Senegal
UPPER SENEGAL AND NIGER
R. Niger
DAHOMEY
TOGO
GOLD COAST
IVORY COAST
LIBERIA
SIERRA LEONE
Freetown
Monrovia
Grand Bassam
Sekondi
Cape Coast
Acera
Grand Popo
Abomey
Misahöhe
Lagos
SOUTHN NIGERIA
NORTHERN NIGERIA
R. Benue
KAMERUN
Duala
C. Formosa
Fernando Po Island
SPANISH GUINEA
Libreville
R. Ubangi
R. CONGO
FRENCH CONGO
Scale of Statute Miles
0 50 100 200 300 400 500
Scale of Geographical Miles
0 50 100 200 300 400 500
Map of the WEST COAST OF AFRICA
showing the area in which
Yellow Fever is endemic.
Ordnance Survey, Southampton 1913.

and Birkalane, but here again it is more than likely that there were other yellow fever attacks and deaths certified as due to other causes. Several European railway officials were among the victims who succumbed to the disease. A number of the cases were brought to Dakar from the outlying places for isolation and treatment. On December 14th Dakar was reported to be free from the infection, but Reuter's telegraphic agency published in the "Matin" a telegram from their correspondent at Bordeaux to the effect that yellow fever was still "raging" in Senegal, and that the sailings of officials for that colony had been "suspended for the present."

In a report published in the "Presse Médicale" of February 17th, 1913, Dr. D. D'Anfreville gives an account of what he terms "une nouvelle épidémie de fièvre jaune au Senegal." He seems to suggest that the infection in 1912 came either from Portuguese Guinea or from British Gambia. (*See* Map.)

Gambia.—During 1911 some 12 recognised cases of yellow fever were notified in the Gambia at Bathurst, the capital of the colony, situated at the mouth of the river Gambia. The first five cases were Europeans, two of them being Royal Engineers; they were attacked in May. All five patients were friends accustomed to spend much of their time together in the Engineers' quarters in a large room where soda-water was manufactured and where band practices were held daily. Natives were consequently often present in the room. A native soldier in charge of the soda-water machine was taken to hospital just prior to the outbreak, and his illness was believed to have been a mild attack of yellow fever. It is surmised that he infected the stegomyiæ which afterwards bit the five Europeans. Another possible explanation of the origin of the cases is that that s.s. *Akassa*, from the coast, was lying off Government wharf in the earlier part of May, and four at least of those who developed yellow fever at Bathurst had gone on board the vessel and spent some hours on it. The suggestion is that this ship had brought with it some infected stegomyiæ from a port on the coast; it is also reported that a man had died on board the ship before it had reached Dakar. Subsequent inquiries seem to negative this latter source of infection. Among those who contracted the disease at Bathurst was the Governor's valet, who succumbed to his attack. No further cases occurred until July, when an assistant engineer of the Government vessels in the Gambia was notified to be ill of yellow fever, and seven other cases occurred subsequently, four among Europeans and three among Syrians, up to the end of August. Among the Europeans attacked was a Roman Catholic brother who lived in the town, but who visited a mission station 10 miles away. The last case was notified on August 28th, and no further attacks were reported until November 18th, when a French clerk living in Bathurst fell ill and died of the disease shortly afterwards. No definite source was traced trom which this last case had contracted the infection. A fatal illness in a European, on November 15th, not certified as yellow fever, but as pernicious malaria, was regarded with some suspicion. Thus, 13 cases, of which 10 were fatal, occurred in Bathurst during 1911, in addition to the suspicious fatal case mentioned above. It is possible that other and milder attacks occurred, but which were not recognised as yellow fever.

Portuguese Guinea.—This Portuguese colony is bounded on the north and south by French Guinea, and includes a group of some 30 islands off its coast known as the Bissagos Archipelago. During May and June, 1911, the presence of yellow fever was reported at

Boulama, one of the islands of the group situated at the mouth of the Rio Grande, and the disease was also said to have occurred about the same time at Bissao, which is on another island at the mouth of the Rio Geba ; but beyond the fact that yellow fever was present at these places no other information has been forthcoming. In December, 1911, another report was received to the effect that during that month a European enginecr had died from the malady on a vessel at Boulama ; but whether this was a continuation of the previous prevalence observed in May and June, or, on the other hand, a fresh importation of the infection from without, there is no evidence at present to show. The estimated population of this colony is about a million.

Sierra Leone.—In April, 1911, yellow fever was reported to be present in the colony of Sierra Leone, but no particulars were given. In the previous year an outbreak began at Freetown in April, comprising some 21 cases, of which 16 proved fatal. Of those attacked nine were Syrian traders, eight Europeans and four negroes. The last case was reported in September. It has been suggested that yellow fever exists in an unrecognised form among the natives of Sierra Leone. It is known that a malady called "Bayloo," believed to be infectious, prevails at times among the natives chiefly among children. The disease has been described in a report by Dr. R. H. Kennan, Senior Sanitary Officer, Sierra Leone, with comments by Dr. W. J. Collett, Senior Medical Officer for the colony.* It has a sudden onset with acute febrile symptoms vomiting and prostration, with subsequent yellowness of the skin, and it is sometimes fatal. Dr. Collett's view is that the grounds at present are insufficient for considering "Bayloo" as a modified form of yellow fever, or indeed for accepting it as a separate entity.

The Gold Coast.—In February, 1911, two Europeans were attacked by illness looked upon with grave suspicion as likely to be yellow fever, at Accra, the capital of the Gold Coast Colony. No further cases were observed until May, when three Europeans and three natives were certified as suffering from the disease. In June two more Europeans were attacked, making a total of ten cases (seven Europeans and three natives), of whom seven died (all Europeans). The following were the measures employed to prevent the extension of the infection :—Europeans were inspected daily ; a post-mortem examination was made of all natives dying under suspicious circumstances ; every merchant's premises in the town were fumigated with sulphur, and there was a free issue of sulphur and Alformant lamps. In addition, a special gang was organised for the destruction of mosquitoes and their breeding places, more especially in the neighbourhood of the infected premises. Contacts were segregated for ten days and native dwellings, as well as those of Europeans, were thoroughly fumigated. The large buildings were disinfected by Clayton's apparatus ; the sick were isolated in screened mosquito-proof apartments. The low and dense scrub was cut down and the roots dug up. No further cases occurred from the end of June until December 20th, when a fatal attack in a European was certified, though a case attended with some suspicion was observed during August.

In March, 1913, Lady Clifford, wife of the Governor, and Capt. Dalrymple, his aide-de-camp, were attacked by yellow fever at Accra, and also five natives.

At the village of Avreboo, in the Gold Coast Colony, in June, 1911, a European died of yellow fever, but the source of his infection was

* Published by the Colonial Office in the "Report on Certain Outbreaks of Yellow Fever in 1910 and 1911 in West Africa." (Appendix C.)

not traced. Avreboo is ten miles from Axim, where yellow fever was reported in 1910, and it is surrounded by brush and trees. The whole locality is infested by stegomyiæ, but the deceased, it is said, had always slept under a mosquito net.

During 1912, in the month of May, a single fatal case of yellow fever was certified at Secondee, where 13 cases had been notified in 1910.

Togoland.—The German Protectorate of Togoland lies between the British Gold Coast Colony and French Dahomey. A few sporadic cases of yellow fever were officially reported in Togoland during 1911. Official records show that the disease has been appearing in sporadic form since 1905. From that date to the end of 1911 about 27 reported cases had come under observation, 14 of them Europeans and 13 natives. Of the total number 18 proved fatal. There is no information as yet as to the occurrence of the disease in this Protectorate during 1912. The German medical staff on duty in this region hold the opinion that yellow fever exists endemically among the natives, generally in an extremely mild and almost unrecognisable form. The cases which have been officially reported do not seem to have had any apparent connection with one another and they were distributed over a number of places including Lome (the capital of the Protectorate), Anecho (formerly the seat of the Government), Grandpopo, Agone, Badja, Torega, Sebe, Anima and Misahöhe.

It may be mentioned that in 1910 the occurrence of an epidemic was reported at Anima in the Trans-Kara region, about 60 kilometres north of Sokode. In five days (July 26th to 30th) 55 cases of illness and 25 deaths were recorded. Dr. Zupitza arrived at Zokode a fortnight later and saw three of the cases and one death; his inquiries led him to conclude that the epidemic had been yellow fever. In 1911 some suspicious cases of the same sort came under notice at Misahöhe and Sokode.

Dahomey.—The French colony of Dahomey lies between German Togoland and British Nigeria, on the so-called Slave Coast of West Africa, in the Gulf of Guinea, and its capital is Abomey. Yellow fever has been present in this colony from time to time in past years; but so far as can be ascertained there were no cases reported since the outbreak which occurred in 1905–6 until May, 1912, when a number of cases among Europeans were notified. The first recognised attacks in 1912 were three young Germans living at Bohicon, near Abomey. Other Europeans fell ill with similar symptons, and inquiries which were then instituted showed that four Europeans had previous to this time suffered from an illness which the medical officers on the spot considered to be a mild form of yellow-fever infection. While these cases were occurring among the Europeans it was found that the death rate among the natives had been unusually high especially among children and adolescents. Persons who stayed at Bohicon on their way to Cotonon were attacked by the prevalent malady, so that Bohicon was officially declared infected by yellow fever, and stringent measures were taken to prevent the spread of the disease. People were forbidden to travel by train from Bohicon, no one being allowed to go by rail except certain officials. The place was surrounded by a "sanitary cordon," to prevent the native population making any outward movement. The Europeans were induced to camp out for a time in small groups which did not communicate with one another, and steps were taken to destroy mosquitoes by fumigation of houses with sulphur, tobacco or formalin. The breeding of these insects

was prevented by filling up or draining all stagnant pools or collections of surface water, by covering up of wells and by the screening of household cisterns, &c. Contravention of these regulations by the natives was punished by imposing unpaid working days, and in this way extra labour was obtained. After these measures were begun only one more case was reported. Whether the infection was imported from some other place or whether the disease was endemic among the natives has not been definitely proved. A single case of yellow fever was reported in June, 1912 at Porto Novo which is in the French territory, near the British frontier of Nigeria. It may be mentioned in this connection that there was an outbreak of yellow fever in Southern Nigeria during 1913, the infection being possibly conveyed across the borders from Dahomey. It is also interesting to mention that at the urgent request of the Governor of Southern Nigeria, the Colonial Office despatched Dr. H. Seidelin to make investigation as to the nature and extent of the infection among the native population and others in that Colony. The report of this expert is expected to throw additional light upon various points associated with yellow fever, and especially as to the presence or absence of the *paraplasma flavigenum* in the blood of those suffering from the disease; and whether it is possible to find this parasite in any other animals than man and the stegomyia mosquito.